

CLAIMS

1. Multi-carrier communication system wherein data are transferred bi-directionally in a time division duplexed way, and

5 wherein a first pilot carrier whose instantaneous frequency is a fraction of a sample rate of a first transceiver (VDSL_LT) and which is orthogonal to other carriers used in said multi-carrier communication system, is transferred to enable a second transceiver (VDSL_NT) to recover said sample rate,

10 CHARACTERISED IN THAT a second pilot carrier whose mean frequency is a fraction of a time division duplexing frame rate and which is orthogonal to other carriers used in said multi-carrier communication system, is transferred from said first transceiver (VDSL_LT) to said second transceiver (VDSL_NT) to enable said

15 second transceiver (VDSL_NT) to recover said time division duplexing frame rate, said second pilot carrier being different from said first pilot carrier.

2. Multi-carrier communication system according to claim 1,

20 CHARACTERISED IN THAT said first pilot carrier is constituted by interpolating a plurality of carriers.

3. Multi-carrier communication system according to claim 1 or claim 2,

25 CHARACTERISED IN THAT said first pilot carrier and/or said second pilot carrier are/is randomised.

4. Multi-carrier communication system according to claim 1 or claim 2,

CHARACTERISED IN THAT said first pilot carrier and/or said second pilot carrier are/is modulated with data.

5. Multi-carrier transmitter (VDSL_LT) suitable for use in a time division duplexing system, said multi-carrier transmitter (VDSL_LT) comprising:

- a. first pilot carrier generation means (IFFT, DAC), adapted to generate a first pilot carrier whose instantaneous frequency is a fraction of a sample rate and which is orthogonal to other carriers
- 10 transmitted by said transmitter (VDSL_LT); and
- b. first pilot carrier transmission means, coupled to said first pilot carrier generation means (IFFT, DAC) and adapted to transmit said first pilot carrier,

CHARACTERISED IN THAT said multi-carrier transmitter (VDSL_LT) 15 further comprises:

- c. second pilot carrier generation means (ROT, IFFT, T/S, DAC, PLL), adapted to generate a second pilot carrier whose mean frequency is a fraction of a time division duplexing frame rate and which is orthogonal to other carriers transmitted by said transmitter,
- 20 said second pilot carrier being different from said first pilot carrier; and
- d. second pilot carrier transmission means, coupled to said second pilot carrier generation means (ROT, IFFT, T/S, DAC, PLL) and adapted to transmit said second pilot carrier.

25 6. Multi-carrier receiver (VDSL_NT) suitable for use in a time division duplexing system, said multi-carrier receiver (VDSL_NT) comprising:

- a. first pilot carrier receiving means (ADC, S/D, FFT, ROT1, PLL1),
- 30 adapted to receive a first pilot carrier whose instantaneous

frequency is a fraction of a transmitter sample rate and which is orthogonal to other carriers received by said multi-carrier receiver (VDSL_NT),

CHARACTERISED IN THAT said multi-carrier receiver (VDSL_NT)

- 5 further comprises:
 - b. second pilot carrier receiving means (ADC, S/D, FFT, ROT2, ROT1, PLL1, PLL2), adapted to receive a second pilot carrier whose mean frequency is a fraction of a time division duplexing frame rate and which is orthogonal to other carriers received by said multi-
- 10 carrier receiver (VDSL_NT), said second pilot carrier being different from said first pilot carrier.

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